Northwest Arctic Borough
Coastal Management Program

Northwest Arctic Borough Attachment Area

RESOURCE INVENTORY AND ANALYSIS REPORT

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PART 1: SUPPLEMENTAL RESOURCE INVENTORY FOR THE ATTACHMENT AREA

Since fish and wildlife life history information has previously been presented in Volume 2 of the NANA Region Coastal Management Plan, the primary emphasis of this chapter is to identify coastal habitats and the distribution, important use areas, harvest and subsistence use activities, and area-specific life history information for biological resources in the Attachment Area. The organization of this section involves a brief narrative discussion of regional conditions, coastal habitats, anadromous and freshwater fish, birds, and mammals. Where appropriate, the discussions are keyed to information presented on Maps 1A through 6A and the NANA Region Map Atlas (October 1985); these number also correspond to the supplemental maps prepared for the Attachment Area.

Regional Conditions

Coastal and lower elevation areas in the western portion of the Attachment Area receive approximately 10 inches of precipitation annually. Higher elevation inland areas in the eastern portion of the Attachment Area receive 25-30 inches of precipitation annually. Rainfall generally increases as the summer progresses, peaking in August. Annual snowfall ranges from approximately 45 inches in the west to more than 100 inches at higher elevations in the eastern part of the Attachment Area (NPS, 1986).

The physiography of the DeLong Mountains includes glaciated ridges to approximately 5,000 feet in elevation bisected by drainage basins oriented northeast-southwest in the western part (Kivalina and Wulik Rivers) and north-south (northern tributaries of the Noatak River) in the central and eastern portions of the Attachment Area.

Soils of the DeLong Mountains within the Attachment Area can be characterized as upland or mountain soils (lithosol type), tundra soils, and soils associated with the Noatak drainage and lowlands. Lithosol soils on the higher slopes are limited and are imperfectly weathered rock fragments and barren rock. The soil is without zonation and consists of the thin layer of highly gravelly and stony loam. Where this soil accumulates in protected pockets on mountain slopes, it supports mosses, lichens, and some dwarf shrubs.

At lower elevations on more gently rolling terrain, dark, humus-rich, non-acid tundra soils predominate. The texture of tundra soils varies from highly gravelly to sandy.

The floodplains of the Noatak River and its tributaries are characterized by silty and sandy sediments and gravel. The proportion of organic material in these soils is greatest along the lower portions of the Noatak River. A layer of fibrous peat extends to the permafrost layer in many areas, and the vegetation includes mosses and sedges with black spruce more abundant in loamy areas (NPS, 1986).

Permafrost is generally present throughout the Attachment Area with areas of seasonally-thawed alluvial material associated with riparian habitats adjacent to some watercourses. Natural soil erosion along the banks of the Noatak River is considered severe. Breakup flows in the spring and seasonal storms produce high volumes and velocities of water which hydraulically erode the river banks. Where ice-rich soils or ground ice contact flowing water, thermal erosion can occur (NPS, 1986).

Coastal Habitats

Within the Attachment Area, the coastal habitats are comprised of:

- Offshore Areas
- High Energy Coast
- Barrier Islands and Lagoons
- Wetlands
- Rivers, Lakes, and Streams
- Important Uplands

The definition and general description of these coastal habitats is provided in Volume 2, Background Report, NANA Coastal Management Program (October 1985). The occurrence of these habitats in the Attachment Area is described below along with pertinent information concerning the character of these areas. Coastal habitat locations are shown on Map 2A. Biological resources generally associated with coastal habitats in this region are described in Volume 2.

Offshore Areas/High Energy Coast:

Offshore Areas are of limited extent in the Attachment Area, occurring only in the short segment of coastline adjoining the Chukchi Sea north of latitude 68 degrees north, extending to the northern boundary of the Northwest Arctic Borough. A high energy coast receiving direct exposure to marine coastal processes is present along the seaward shoreline of the barrier island system associated with Singoalik Lagoon.

Barrier Islands and Lagoons:

Singoalik Lagoon and its associated barrier islands and sand spits are the only example of this coastal habitat present in the Attachment Area.

Wetlands:

Wetland habitats in the Attachment Area are generally associated with riparian areas adjacent to the Kivalina River, Kelly River near its confluence with the Noatak River, Nimiuktuk River, Anisak River, and middle Noatak River valley. Delineation of wetland habitats is difficult in this area due to a lack of area-specific determinations by resource agencies.

Wetland identification, therefore, has been derived from U.S. Geological Survey mapping, general topography and drainage patterns, and the presence of biological use areas which rely heavily on wetland habitats. Permafrost, impeded drainage, and the presence of significant areas of moist tundra suggest that the actual occurrence of wetland habitats is greater than that depicted on Map 2A. Site specific determination of the presence of wetland habitats is recommended when evaluating proposed uses and activities within the Attachment Area.

Rivers, Lakes, and Streams:

The general occurrence of this coastal habitat is shown on Map 2 of the NANA Region Map Atlas (October 1985). Limitations of scale and mapping capability necessitate portrayal of only the larger representatives of this important aquatic habitat. The greatest biological resource values present in the Attachment Area are generally associated with anadromous fish habitats and riparian areas adjacent to rivers, lakes, and streams. Wide distribution of this coastal habitat type is due to the variable topography and drainage basin patterns of the principal watercourses and headwater streams present in the Attachment Area.

The principal drainage basins which provide this coastal habitat are the Kivalina River, the Wulik River, and the middle and upper Noatak River, including its northern tributaries (Kelly, Kugururok, Kaluktarik, Nimiuktuk, Anisak, and Aniuk rivers). The Kivalina and Wulik rivers have their headwaters in the western Delong Mountains, and they drain directly to the Chukchi Sea. The Mulgrave Hills separate the Wulik and Noatak River basins.

The Noatak River is 435 miles in length, emptying into Kotzebue Sound. From approximately upstream of its confluence with the Kelly River, the course of the Noatak River undulates along the southern boundary of the Attachment Area within the Noatak National Preserve. Its principal tributaries along this segment of the river basin are from the north with headwaters in the DeLong Mountains of the Brooks Range.

Below the Aniuk River confluence, the Noatak River valley widens into a broad plateau, flanked by bedrock ridges 20 to 40 miles apart. The valley floor is a vast till plain into which the river and its modern floodplain are incised to a depth of 200 feet or more. Nearly continuous lines of 100-foot high bluffs border the floodplain or intersect the river's course in places where the river flows against them (NPS, 1986).

The broad central basin of the Noatak River extends some 50 miles west to the Aglungak Hills near the Nimiuktuk River confluence. At this point, the Noatak River valley narrows to less than three miles wide at some points. This 65-mile long valley is known as the "Grand Canyon of the Noatak", and it cuts a broad S-curve in the river's course. At the lower end of the valley, the river travels for seven miles through the Noatak Canyon, a gorge with vertical walls of metamorphic rock 200-300 feet high (NPS, 1986).

Gravel bar and alluvial floodplain vegetation is represented by shrub communities adjacent to rivers and streams. These communities occur along portions of the Kivalina, Wulik, and Noatak Rivers and their principal tributaries. This type of vegetation is dominant along the floodplain of the Noatak River and its tributaries west of the Noatak Canyon. Shrubs are

generally 3 to 10 feet high with with no tree development. Willows are dominant, often in association with dwarf birch and alder. Herbaceous species present include river beauty, willow herb, fireweed, grasses, and sedges (NPS, 1986).

Important Uplands:

The Important Uplands are the most extensive coastal habitat in the Attachment Area. The character of this habitat varies from forested uplands along the lower reaches of major stream drainages (primarily the Noatak River) to extensive shrub thickets, alpine tundra, and barren unvegetated lands at higher elevations.

A spruce forest community is found on south-facing foothills, valley bottoms, well-drained terraces, and some lowlands generally downstream from the Kugururok River in the Noatak watershed of the Attachment Area. This upland spruce forest occupies a major portion of the lands flanking the lower reaches of the Kelly and Kugururok Rivers. Nearly pure stands of white spruce are found in association with paper birch, aspen, balsam poplar, and black spruce. The forest is generally open with mature white spruce attaining a height of 50 to 60 feet. Understory shrubs are sparse and include willows and northern red currant. Ground cover consists of sphagnum mosses, reindeer lichens, dwarf shrubs, ferns, and grasses.

Small stands of balsam poplar-cottonwood occur on well-drained, south-facing slopes in isolated areas generally downstream from the confluence of the Noatak River and Makpik Creek. In these cottonwood patches seldom more than a few acres in size, bearberry, soapberry, and shrubby cinquefoil form the understory (NPS, 1986). Similar small cottonwood stands can be found along portions of the Kivalina and Wulik Rivers.

Above the forested communities and in areas where level topography or impeded drainage are present, a moist tundra community predominates. Within the Noatak National Preserve, this community is the most extensive type and in many areas consists almost entirely of pure stands of cottongrass. Shrubs and other species found in moist tundra include willow, dwarf birch, Labrador tea, Lapland rosebay, mountain alder, mountain avens, and saxifrages. Bog rosemary, cranberry, and butterwort are found in wetter areas. Where standing water is present for most of the summer and peaty soil inhibits water percolation, bluejoint, pendant grass, sedges, and rushes are present and mosses become more abundant. Herbaceous plants including salmonberry, louseworts, and marsh fivefinger occupy less boggy locations (NPS, 1986).

An alpine tundra community is found on windswept, well-drained rocky slopes at higher elevations (generally 2,500 to 5,000 feet). Vegetation, if present, is sparse and consists of willow, heather, and avens in combination with grasses, sedges, wildflowers, and mosses. Lichens and saxifrages are common in drier areas. Alpine tundra forms a low vegetative mat limited to a few inches in height (NPS, 1986).

Anadromous and Freshwater Fish

Twenty-two species of fish are found within Noatak River drainage. Arctic char and grayling are the most common sport fish. Most Arctic char in the Noatak National Preserve are anadromous and are found in the Noatak River and its tributaries upriver as far as the Kugrak River. Chum salmon are present throughout the Noatak River drainage, but sockeye, coho, king, and pink salmon are fewer in number and generally limited to lower reaches of Noatak River tributaries and the Noatak main stem. Chum salmon are the most abundant species, and along with Arctic char are important subsistence resources. Burbot, lake trout, northern pike, whitefish, long-nosed sucker, and least cisco are present in rivers and lakes in the Noatak drainage (NPS, 1986).

The Kivalina and Wulik Rivers provide important aquatic habitats for spawning, rearing, and overwintering of salmon, Arctic char, and resident fish. Important populations of anadromous fish utilize these systems and provide an important subsistence resource for residents of Kivalina and residents of Kotzebue.

Arctic Char:

Anadromous Arctic char are present in essentially all of the major rivers which drain the uplands of the Attachment Area (Map 4A). The systems which provide char habitat include the Kivalina River, Wulik River, and northern tributaries of the Noatak River (Kelly, Kugururok, Kaluktavik, Nimiuktuk, and Anisak Rivers). Char utilize more extensive areas of river habitat in the Attachment Area than any other species of anadromous fish.

Water quality parameters such as dissolved oxygen and temperature, and physical characteristics of streams and lakes such as depth, velocity, and substrate type, are important factors affecting the distribution of Arctic char. In this area, char are often associated with spring-fed aquatic habitats which they use as spawning grounds, summer rearing areas for fry and juveniles, and overwintering areas. Perennial sources of water (year-round stream flow) are necessary to assure the winter survival of char eggs which are spawned in the fall but do not hatch until early spring, and the overwintering of mature adults and juvenile fish (ADNR, 1987d).

In the Noatak, Wulik, and Kivalina Rivers, summer-spawning Arctic char which do not go to sea prior to spawning enter tributary streams between late June and the end of July. After spawning, summer spawners move out of the tributaries and may migrate to sea for up to several months. Fall-spawning Arctic char enter the Noatak, Wulik, and Kivalina Rivers and Noatak River tributaries in mid August; the fall in-migration is prolonged, extending into late September (ADNR, 1987d).

In the Noatak River and its northern tributary system, some spawning takes place in and around springs; however, most spawning occurs downstream of springs in the main channels of streams. Many spawning areas in the Kivalina River are near spring areas. In the

Wulik River, most spawning grounds for Arctic char are not directly influenced by ground water. Between 1980 and 1983, aerial surveys for spawning Arctic char recorded up to 700 fish in the portion of the Kivalina River drainage surveyed, and up to 1200 fish in the area of the Wulik River surveyed (ADNR, 1987d). Similar aerial surveys along Noatak River tributaries between 1980 and 1983 reported peak spawning populations of 2,900 char in the Kelly River, 4,000 char in the Kugururok River, 550 char in the Kaluktavik River, and 2,200 char in the Nimiuktuk River.

Although it appears that anadromous Arctic char return to their natal stream to spawn, non-spawners from the Wulik and Kivalina River drainages have been observed to overwinter elsewhere in the same drainage and in non-natal drainages. In the Noatak River, char move from tributary streams used for summer spawning to the main stem of the Noatak River in late fall. Movements as far as 185 kilometers (115 miles) to overwintering areas have been observed (ADNR, 1987d). Alaska Department of Fish and Game surveys of overwintering char between 1968 and 1982 reported peak populations of 45,000 char in the Noatak River, 297,000 char in the Wulik River, and 45,000 char in the Kivalina River.

Char from the Wulik, Kivalina, and Noatak River systems outmigrate to ocean waters in late May or early June. If sea ice has moved far offshore, the migration will be of short duration and most char will have departed the freshwater rivers by late June. Some summer-spawning Arctic char do not migrate seaward in the spring but move directly to spawning grounds. Once the char leave fresh water, they disperse along the coastline, in some cases covering large distances. During the summer, Arctic char from the Wulik and Kivalina rivers move south through Kotzebue Sound and at least as far north as Point Hope (ADNR, 1987d).

Chum Salmon:

Chum salmon are distributed more extensively throughout the rivers and streams of the Attachment Area than pink, coho, sockeye, or king salmon (Map 3A). In the Kivalina and Wulik rivers, chum salmon have been documented upstream to approximately the southern boundary of the Attachment Area. It is not known if this reflects the actual limits of their distribution or the limits of fishery surveys to date. In the northern tributaries of the Noatak River, chum salmon are present through the middle Kelly River and its principal eastern tributary, the Kugururok and Kaluktavik Rivers to the northern boundary of the Attachment Area, and upstream in the Nimiuktuk River to within five miles of the northern boundary of the Attachment Area. In the main stem of the Noatak River, chum salmon are present to nearly the headwaters of the system.

Within the Kotzebue District commercial fishing area, chum salmon reach peak abundance in the salt water fishery prior to August 1st. In the Noatak River drainage, peak "eyeing" of chum salmon eggs occurs in early November and hatching takes place from late December through January. Chum fry emerge from the incubating gravels of spawning areas in early May and outmigrate into Kotzebue Sound in mid-June. Juvenile chum salmon then remain in nearshore Kotzebue Sound waters until early July, moving into offshore areas until maturity (ADNR, 1987d).

Escapement estimates for chum salmon entering rivers which drain the Attachment Area are limited; Kelly River and Kelly Lake had a peak escapement of 13,800 chum salmon between 1973 and 1984. During the same period, the peak recorded escapement for chum salmon in the Noatak River upstream from the Kelly River confluence was approximately 24,000 fish (ADNR, 1987d).

Pink, Sockeye, Coho, and King Salmon:

Pink salmon are present in the main stem Noatak River up to the confluence with the Nimiuktuk River (Map 3A). Their distribution is generally limited to the lower reaches of rivers and streams which drain the Attachment Area.

Smaller numbers of sockeye, coho, and king salmon are present in the Kivalina, Wulik, and Kelly Rivers to approximately the southern boundary of the Attachment Area (Map 3A). Little information is available concerning their numbers and timing of life history activities in these systems.

Freshwater Fish:

Non-anadromous Dolly Varden and Arctic grayling are present in most of the flowing freshwater systems and lakes in the Attachment Area. Available information concerning the known distribution of other species of freshwater fish is shown on Map 4A.

Birds

Bird species and their important habitats within the NANA Region are described in Volume 2 of the coastal management program. Within the Attachment Area, habitats of importance to waterfowl occur in wetland areas associated with riparian stream habitats and in areas of moist tundra interspersed with ponds and lakes. While more extensive wetland areas utilized by ducks and geese are present in coastal areas and further south in the NANA Region (particularly along the Kobuk and Selawik Rivers), wetlands which provide important waterfowl habitat for nesting and molting are present east of the Kivalina River, in the lower reaches of the Kelly and Kugururok rivers, and along the Noatak River valley downstream from its confluence with Kaluktavik River (ADF&G, 1974; ADF&G, 1986). Pintail, greater scaup, and widgeon contribute to more than two-thirds of the waterfowl population in the Kotzebue Sound Region (ADNR, 1987d).

Wetland areas along the Noatak River support a variety of waterfowl. The Taverner's Canada goose and the white-fronted goose are common breeding species in the area. Within the Noatak National Preserve, approximately 200 pairs of tundra swans nest on the dry shores of tundra lakes, particularly in the Noatak drainage west of its confluence with the Kelly River. These swans are part of populations which winter in both California and along the Atlantic coast. Other common waterfowl include pintail, American wigeon, greater scaup, oldsquaw, and red-breasted merganser. Less common species include black brant, snow

goose, mallard, green-winged teal, shoveler, common goldeneye, harlequin, and black scoter (NPS, 1986).

The distribution of waterfowl habitat within the Attachment Area is shown on Map 6A.

Mammals

The principal mammal species of concern within the Attachment Area are the grizzly bear, caribou, and Dall sheep. Discussions of their distribution and use areas are presented below.

Brown/Grizzly Bear:

Within the Attachment Area, grizzly bears seasonally concentrate along streams to feed on locally-abundant spawning salmon or Arctic char. At other times of the year, they are dispersed in suitable upland habitats. The densities of bears within the region have been estimated to be in the range of one bear per 129 square kilometers (50 square miles) in high foothills of the DeLong Mountains, and one bear per 259 square kilometers (100 square miles) in mountainous upland habitats. Within Game Management Unit 23 where the Attachment Area is located, the grizzly bear population appears to have recently stopped increasing and may now be at a stable population level (ADNR, 1987d). During 1987, 19 grizzly bears were reported harvested from the Noatak River drainage, and five bears were harvested byhunters in the Wulik and Kivalina River drainages (D. Larsen, ADFG, personal communication).

Caribou:

Caribou of the Western Arctic Herd (WAH) utilize the habitats of the Attachment area primarily during post-calving movements from the primary calving areas in the Utukok uplands, during spring migration north to the calving area, and during fall migrations south to preferred wintering areas in the southern portions of the NANA region. This caribou herd experienced significant declines in population during the mid 1970s when their numbers dropped to approximately 75,000 animals (ADNR, 1987d). The WAH population is currently healthy and recent population estimates place the number of caribou at approximately 230,000 animals (R. Shideler, ADF&G, personal communication). Between 1982 and 1986, the Western Arctic Herd population increased approximately 8% annually (D. James, ADFG, personal communication).

The spring migration of caribou northward from wintering habitats begins in March and continues until early to mid-April (NPS, 1986). Observations in 1976 by Valkenburg et al. (1983) reported that animals wintering in the Kiana Hills migrated up the Noatak River valley past the mouth of the Kelly River and then probably moved up the Kugururok or Nimiuktuk Rivers to reach the calving grounds (Map 5A). Caribou migrating northward across the upper Noatak River to the Utukok River calving grounds often use the Anisak River valley to cross the DeLong Mountains (ADNR, 1987d). Calving occurs between May 25 and June 25 north of the DeLong Mountains (NPS, 1986).

Fall migration through the area is usually initiated in late August or early September, stimulated by the first snowfall. Fall movements of caribou across the Noatak River generally occur from mid-September to early October (NPS, 1986). Migration routes southward through the Attachment Area include portions of the Wulik, Kelly, and Kugururok River drainages; these caribou frequently continue their southward movements along the lower Noatak River valley. In some years, part of the WAH caribou move along the coast between Point Hope and Kotzebue, passing through the extreme western portion of the Attachment Area. Occasionally the caribou travel up the Wulik River to the Kugururok River, then turn south to reach the lower Noatak River valley (ADNR, 1987d).

Caribou migrating south across the eastern portion of the Attachment Area commonly use the Nimiuktuk, Anisak, and Aniuk River valleys to cross the DeLong Mountains as they progress toward the Noatak, Salmon, Hunt, and Cutler River valleys (ADF&G, 1986).

In recent years, approximately 3-5,000 caribou have migrated south from the Noatak Canyon to the headwaters of the Wulik River in mid-September to winter in the Mulgrave Hills. In late March, they move north along the west side of the Noatak River and follow the Kelly River to calving areas on the north side of the Brooks Range. A post-calving movement of approximately 20,000 caribou travels through the headwaters of the Kivalina and Wulik Rivers in early summer, migrating near the Red Dog project as they move toward the Noatak River and up the Kelly River. Although this movement has been observed in recent years, there does not appear to be a trend toward increased activity or frequency of caribou presence in the Red Dog area (J. Hemming, Dames and Moore, personal communication).

Within ADF&G Game Management Unit (GMU) 23, which the encompasses the Attachment Area, 4,018 caribou were reported harvested duirng the 1985-86 season and 3,398 caribou were reported harvested in 1986-87. Since a significant portion of the harvest is not reported by hunters, the actual annual harvest of caribou may range between 6,000 and 15,000 animals (D. Larsen, ADFG, presonal communication).

Habitat loss and alteration due to industrial development and other land uses are major concerns with respect to the continued health of the Western Arctic caribou herd. This highly migratory herd may be particularly vulnerable to disturbance of migration routes and key calving and wintering habitats through activities associated with petroleum and mineral development (ADNR, 1987d).

Dall Sheep:

Within the Attachment Area, Dall sheep are present in suitable upland habitats throughout the upper watersheds of the Kivalina, Wulik, Kelly, and Kugururok Rivers, and in the higher elevation uplands between the Kugururok River and the Nimiuktuk River (ADF&G, 1986). Within this region, Dall sheep reach the northwest limit of their distribution. The presence of important Dall sheep habitat within the Attachment Area is shown on Map 5A.

Within Game Management Unit (GMU) 23 which encompasses this area, Dall sheep densities are generally considered low in comparison to other areas in western and northern

Alaska. Although Dall sheep are generally found in alpine habitats above the 2,500-foot elevation, the topography in the western Brooks Range is less steep and lower in elevation than other areas of typical sheep habitat. Dall sheep utilize these lower elevation habitats and are often observed along bluffs and other steep escape terrain areas adjacent to the Noatak River Canyon, particularly in the early fall. Although most sightings occur at elevations of 1,200 to 2,500 feet, observations of Dall sheep have been reported as low as the 700-foot elevation (ADNR, 1987d).

The Dall sheep population within GMU 23 (of which the Attachment Area is only a part) has been estimated between 3,000 to 3,500 animals, based on surveys conducted by the National Park Service and the Alaska Department of Fish and Game (ADNR, 1987d). The population of Dall sheep appears to have increased considerably since 1977. However, the precise reason for these increased numbers cannot be determined since a number of factors are involved including more effective observation techniques, variations in lamb production, favorable climatic conditions, low predator densities, and improved compliance with hunting regulations (ADNR, 1987d).

Within the Noatak National Preserve, important habitats for Dall sheep are found in the upper Kelly and Kugururok River drainages (NPS, 1986). Aerial surveys for Dall sheep within the Preserve in 1983 (Singer et. al, 1983) observed 777 sheep in habitats north of the Noatak River, and 131 sheep in the vicinity of the Wulik Peaks. Lamb, yearling, and two-year-old ewe ratios north of the Noatak River were nearly double those noted for surveys south of the Noatak River. In general, Dall sheep north of the Noatak River were observed at higher elevations (approximately 2,100 feet) than those observed in coastal areas or in surveys south of the Noatak River. The greatest percentage of observations were made in habitats characterized as alpine tundra and talus slopes with Dryas/mat cushion and Dryas/sedge-grass vegetation.

The 1986-87 rerported harvest of Dall sheep in Delong Mountains of the attachment Area was two ewes. During 1987-88, the harvest in the same area was 19 rams (D. Larsen, ADFG, personal communication).

Moose:

Moose are present throughout the vegetated uplands and riparian habitats of major rivers and their tributaries. The well-being of moose populations is closely associated with the availability of suitable winter habitat, primarily riparian willow along major drainages. Within the Attachment Area, winter concentrations of moose have been identified by ADF&G (1986) along the floodplains and vegetated valleys of the following river systems: Kivalina, Wulik, Kelly, Kugururok, Kaluktavik, Nimiuktuk, and Noatak (Map 5A). A winter moose survey by Quimby and James (1985) reported a population of approximately 175 moose in the Wulik and Kivalina river drainages; and they noted that the population appeared to be increasing moderately.

A 1985 aerial survey of moose in the middle Noatak River valley (James and Cannon, 1985) included the Kelly and Kugururok River drainages. In this area, the habitat is dominated

by open tundra or tundra-shrub communities with relatively restricted areas of spruce forest. The survey was initiated due to a concern that utilization of winter browse by moose in this area might be approaching the upper limit that the habitat could support. In addition, the middle Noatak River is one of the more heavily hunted areas for moose in the Department of Fish and Game Management Unit 23. During the 1986-87 hunting season, 80 bulls and 3 cows were harvested in the Noatak River Valley (D. Larsen, ADFG, personal communication).

The late winter survey estimated approximately 2,200 moose in the 2,115 square mile survey area with densities in individual survey units ranging from zero to 9.7 moose per square mile. The estimated density of moose over the entire survey area was 0.8 to 1.3 moose per square mile with the Noatak, Kelly, and Kugururok Rivers noted to support high density wintering moose populations (James and Cannon, 1985). The Kugururok River drainage hosts particularly high numbers of the the Noatak National Preserve moose population (NPS, 1986). The tendency for moose to form dense aggregations in high quality winter winter habitat highlights the importance of these riparian areas to the health of the regional moose population.

Attachment Area Land Status

Land ownership in the NANA region has been previously described in Chapter A-3.2, Volume 2- Background Report, of the NANA Coastal Management Plan (October 1985). The major categories of land ownership remain the same: Native lands (Native Selection and Interrim Conveyance); State lands (State Selection, Tentatively Approved, and Patented Lands) and Federal lands (ANILCA Conservation Unit Lands, and those lands outside ANILCA Conservation Units). Some private (non-Native) lands exist as inholdings in federal reserves.

In the western third of the Attachment Area, the majority of lands are State owned or selected (Map 7A). Native owned or selected lands are scattered throughout the region, and in some cases overlay state selections.

The eastern two thirds of the Attachment Area lie within federal ownership, either in the Noatak National Preserve or the Gates of the Arctic National Park and Preserve.

Land Use:

Land use in the Attachment Area is a mix of traditional subsistence activities, site specific mineral exploration and development activities, and dispersed recreation use of rivers and fish and wildlife resources. Map 8 of the NANA Coastal ManagementMap Atlas shows Intensive Resource Use Areas within the Attachment Area used for traditional subsistence activities by the region's villages. Other site-specific uses include mining and recreation-related activities. There are no communities in the Attachment Area.

Within the Attachment Area, state-owned and state-selected lands within the ADNR Northwest Planning Area have been rated for settlement potential (ADNR, 1987e). Most of the area has been rated as "low" suitability or "unsuitable" for development. However, some stream corridors within the middle and upper watersheds of the Kivalina and Wulik Rivers have been identified as "moderate" potential for settlement.

Land Management

The State of Alaska Department of Natural Resources is currently preparing the Northwest Area Plan. This plan, when completed, will result in the classification of State-owned lands for the purposes of management and disposal of state interests in those lands.

The general management plan for the Noatak National Preserve (NPS, 1986) affects a significant portion of the Attachment Area (Map 7A). Section 202(8) of the Alaska National Interest Lands Conservation Act (ANILCA) authorizing the Noatak National Preserve specifies that:

> "The preserve shall be managed for the following purposes, among others: To maintain the environmental integrity of the Noatak River and adjacent uplands within the preserve in such a manner as to assure the continuation of geological and biological processes unimpaired by adverse human activity; to protect habitat for, and populations of, fish and wildlife, including but not limited to caribou, grizzly bears, Dall sheep, moose, wolves, and for waterfowl, raptors, and other species of birds; to protect archeological resources; and in a manner consistent with the foregoing, to provide opportunities for scientific research. The Secretary may establish a board consisting of scientists and other experts in the field of arctic research in order to assist him in the encouragement and administration of research efforts within the preserve."

To this end, the Preserve management plan has identified incompatible uses which would be contrary to the directives of the enabling ANILCA legislation. Of significant importance to the resources of the NANA region are concerns regarding adverse impacts to water quality, habitats, and fish and wildlife use of habitats.

Mineral Resources

General Characteristics:

Mineral resources in the NANA region have been previously described in Chapter B-1.4, Volume 2 - Background Report, of the NANA Coastal Management Plan (October 1985). Like other lands in the Northwest Arctic Borough, the Attachment Area is thought to contain highly valued mineral resources, including both base and precious metals. The Alaska Department of Natural Resources has evaluated available information concerning mineral resource occurrence and potential, as part of development of the Northwest Area Plan (ADNR, 1987c). Over 50 percent of all lands in the Planning Area show moderate to very high mineral potential; this percentage is higher on State and Native Lands in the western portion of the Attachment Area (Map 9A). The mineral discoveries in the DeLong Mountains occur in a belt of rocks that extend for several hundred miles in an east-west direction

along the north flank of the Brooks Range. Exploration activities in this area are mainly reconnaissance in nature; near major discoveries, exploration has been extensive. Mineral occurrences along this belt suggest that other undiscovered deposits may exist.

Although mineral exploration is currently not permitted within the Noatak National Preserve, the DeLong Mountains (which encompass the Attachment Area) are considered to have significant potential for deposits of such metals as chromium, nickel, copper, lead, and zinc (NPS, 1986). This sedimentary terrain with mineral potential crosses the northern portion of the Noatak National Preserve and is reflected in known mineral deposits (Lik-SU, Red Dog, Drenchwater) along the west and north boundaries of the Preserve where lead, zinc, and silver have been found. Anomalous concentrations of zinc have been reported in the upper Kugururok and Anisak river drainages, and other small or unevaluated mineral deposits of chromium, lead, silver, zinc, and copper have been reported within the Preserve (Arctic Environmental Information and Data Center, 1982, cited in NPS, 1986). Although there are presently no valid mining claims within the Noatak National Preserve and the federal lands within the Preserve are closed to new mineral entry, there have been and will continue to be various surficial mineral and geological studies in the preserve by the Bureau of Mines, U.S. Geological Survey, ARCO, EXXON, and Cominco (NPS, 1986).

In the Northwest Area Plan (1987c), an extensive area of historic and active mining claims has been identified in the Attachment Area between the eastern watershed of the Kivalina River and the east limit of the Wulik River watershed, including a small area immediately west of the Kelly River. Placer activity is also noted in an eastern tributary to the Kelly River within the Attachment Area. Within this area, the ADNR Northwest Area Plan has rated the mineral potential of the lands within the Attachment Area as "moderate" to "very high". Most of the area is rated "very high" mineral potential with deposit types identified as: sediment hosted lead-zinc; stratiform barite; polymetal gold-silver veins; mafic-ultramafic copper-nickel- platinum group elements; mafic-ultramafic chromium; mafic-ultramafic asbestos; and carbonate hosted lead-zinc (ADNR, 1987c). Overall, the DeLong Mountains area is an important source of base and precious metals, and should remain so for many years (ADNR, 1987c).

Should unpatented or patented mining claims occur within the Noatak National Preserve (through land exchanges, etc.), they will be subject to National Park Service regulations governing mining operations and access to mining claims. In accordance with section 1010 of ANILCA, the U.S. Geological Survey is conducting an "Alaska Mineral Resources Assessment Program" to assess mineral potential on lands within the Preserve.

Specific Mineral Projects and Deposits:

The Attachment Area contains one major mineral deposit currently being developed, and several other promising prospects that have experienced various levels of exploration and delineation of reserves. These are described briefly below:

Red Dog Project: Red Dog contains at least two major strata-bound massive-sulfide deposits hosted in Pennsylvania or Mississippian shale. The main deposit at Red Dog contains at

least 85 million tons of ore that grades 17.1 percent zinc, 5 percent lead, and 2.4 ounces/ton silver (ADNR, 1987c). Construction of a port facility on the Chukchi Sea south of Kivalina and a road from tidewater to the Red Dog mine site has already commenced. Initial productionfrom the mine is anticipated to be 580,000 tons/year of lead-zinc-silver concentratewith an eventual increase to 700,000 tons/year (J. Gallagher, ADNR update

Lik-SU Deposit: Located 12 miles west of the Red Dog Deposit, the Lik-SU Deposit is a major strata-bound massive-sulfide zinc-lead-silver- cadmium-barite deposit in black shale and chert. Proven reserves are estimated at 25 million tons of ore that grades 9 percent zinc, 3.1 percent lead, and 1.4 oz/ton silver. In 1985, Noranda Exploration Inc. and General Crude Oil Minerals Company signed a 20 year agreement to jointly explore the deposit, and 17,000 feet of reserve delineation holes were drilled. If developed, the Lik-SU Deposit will probably use the Red Dog Haul Road and Port facilities (ADNR and DCED, 1986)

Ginnie Creek Deposit: Ginnie Creek is a zinc-lead-silver deposit located on a tributary to the Kugururok River. The deposit is a disseminated, epigenetic deposit with barite in Noatak Sandstone of Upper Devonian through Lower Missisipian age. Random grab samples of surface material contain 0.3 to 3 percent zinc, and highly variable amounts of lead and silver (ADNR and DCED 1986).

Story Creek Deposit: Story Creek is a zinc-lead-silver-copper-gold deposit located on a tributary to the Aniuk River. The deposit is an epigenetic relacement deposit hosted in brecciated zones in Devonian Kanayut Conglomerate of Kayak Shale. Grab samples of high-grade material contain up to 0.43 percent copper, 34 percent lead, 28.8 percent zinc, 0.04 oz/ton gold, and 30 oz/ton silver (ADNR and DCED 1986).

Whoopee Creek Deposit: Whoopee Creek is a zinc-lead-silver-copper-gold-cadmium deposit located on a tributary to the Aniuk River. The deposit is an epigenetic relacement deposit hosted in brecciated zones in Devonian Kanayut Conglomerate of Kayak Shale. Random grab samples of high-grade material contain up to 0.24 percent copper, 0.37 percent cadmium, 44 percent zinc, 0.14 oz/ton gold, and 14.8 oz/ton silver (ADNR and DCED 1986).

PART 2: SUPPLEMENTAL RESOURCE ANALYSIS FOR THE ATTACHMENT AREA

The Resource Analysis discusses issues and concerns for natural resources in the Attachment Area. Potential uses and activities of the land and ongoing development activities, are described and the possible interaction with coastal habitats and resources is discussed. Land ownership and distribution of mineral resources, and land management plans are considered important factors in the Attachment Area.

The Northwest Area Plan under preparation by the Alaska Department of Natural Resources (ADNR, 1987a-1987e) addresses issues and concerns in a portion of the Attachment Area (Lisburne Peninsula Unit) west of the Kugururok River. The boundaries of the Noatak National Preserve overlap part of this planning area in the vicinity of the Kelly River. Lands within the Noatak National Preserve encompass the remainder of the Attachment Area extending to the eastern boundary of the Northwest Arctic Borough.

Potential Uses and Activities

Lands within the Attachment Area do not include any established communities, but the biological, mineral, subsistence, and recreation values present provide strong influence on current and potential uses of the area. The description of biological resources presented in Part 2 demonstrates the importance of anadromous fish resources associated with river, lake, and stream habitats, particularly for the watersheds of the Kivalina, Wulik, Kelly, Kugururok, and Nimiuktuk rivers. In recent years, greater research effort has been expended by resource agencies to document the presence and importance of fish and wildlife habitats within areas potentially influenced by mineral development and within the Noatak National Preserve.

Anadromous fish resources, particularly Arctic char and chum salmon, are important to subsistence, commercial and sport fishermen, and recreation users. West of the Kelly River within the Attachment Area, the major watersheds which provide critical spawning, rearing, and overwintering habitats for anadromous fish are also located in areas of significant mineral potential. A world-class lead/zinc mine is currently under development at Red Dog, and a port facility and haul road from tidewater near Kivalina to the mine site is presently under construction. The Northwest Arctic Borough coastal management program must address these concurrent uses of resources and provide appropriate measures to insure continued viability of coastal habitats and opportunities for mineral resource extraction activities.

The uses and activities of the lands and resources in the Attachment Area are discussed below:

Oil and Gas:

The lands within the Attachment Area are located in the Brooks Range Province, part of which is underlain by a thick, sedimentary rock structure (ADNR, 1987b). This area exhibits east-west overthrusts and triassic and older rocks exposed on the surface with unknown potential for commercial oil and gas accumulations. There has been no drilling for oil and gas in this portion of the Brooks Range Province, and there are currently no State lease sales scheduled for the area. The prospects for exploration activities taking place in the region within the next five years are fairly low, primarily because of the depressed price of oil and the interest of oil companies in investing financial resources in locations closer to established production areas. Although insufficient information is available to verify oil and gas potential in this area, it is considered to be an area needing further evaluation (ADNR 1987b).

Minerals and Coal:

Mineral resources which are present or have reasonable potential for occurrence within the Attachment Area include both base metals and precious metals. The Alaska Department of Natural Resources has evaluated available information concerning mineral occurrence and potential during development of the Northwest Area Plan (ADNR, 1987c).

Land status will affect potential exploration and development of mineral resources in the region. Many of the State lands in this area were selected primarily for their mineral potential; some selections of lands by Native Corportations were also based on mineral potential. Over 50 percent of all lands in the Alaska Department of Natural Resources Northwest Planning Area show moderate to very high mineral potential, with over 60 percent of state-owned or state-selected lands showing these values (ADNR, 1987c). At the present time, exploration for locatable minerals is allowed on all state lands within the DNR Northwest Planning Area, except in a few small areas specifically closed to mineral entry such as state airports and public roads.

Although much of northwest Alaska is recognized as having areas of high mineralization, exploration for undiscovered deposits and evaluation of know deposits has generally been of a reconnaissance nature. Industry and government have actively explored the DeLong Mountains area for minerals since the early 1970s. These exploration activities resulted in the discovery of one of the world's largest and richest zinc/lead mining districts.

The Lik -Su and Red Dog deposits, located approximately 80 miles north of Kotzebue, have confirmed the presence of an aggregated proven reserve of at least 100 million tons of ore. Construction of a port facility on the Chukchi Sea south of Kivalina and a road from tidewater to the Red Dog mine site has already commenced.

The mineral discoveries in the DeLong Mountains occur in a belt that extends for several hundred miles in an east-west direction along the north flank of the Brooks Range. Exploration activities in this area are mainly reconnaissance in nature; near major discoveries, exploration has been extensive. Mineral occurrences along this belt suggest that other undiscovered deposits may exist.

The potential for occurrence of deposits of coal within the Attachment Area is "very low to low", as rated by the Northwest Area Plan (1987c), except for a small area north of the confluence of the Kelly and the Noatak rivers which is rated "low to medium" potential for coal.

Mineral Development Concerns: Potential impacts associated with exploration and development of mineral resources are discussed in Volume 2, Chapter D of the NANA Region coastal management plan. Public input to the Alaska Department of Natural Resources Northwest Area Plan noted local concerns, primarily from rural villages, with potential conflicts between mining and associated development (such as roads, airstrips) with subsistence activities and other fish and wildlife resource uses, particularly in anadromous streams and coastal areas (ADNR, 1987c). Additionally, rural residents expressed concerns about the possible long term effects of mining and associated activities on fish and wildlife habitats and water quality.

Of all the potential uses of state land, mineral development has the greatest potential to impact subsistence resources (ADNR, 1987c). While mineral development could improve access to some areas and contribute to a cash economy, it must be balanced with loss of wilderness-like qualities important to recreation use, loss of fish and wildlife habitats, and increased competition for subsistence resources.

Recreation:

The draft Northwest Area Plan Recreation Resource Report (ADNR 1987a) recognizes the current level and type of non-consumptive recreational pursuits conducted within the Attachment Area. Within the Kotzebue Subregion discussed in the plan, the Kivalina Unit (including the middle Kivalina and Wulik Rivers) and the Noatak Unit (including the Noatak River and lower Kelly River) provide recreational opportunities for users from outside the region involving primarily dispersed camping and sightseeing activities along major drainages and lakes. At present, float and canoe trips on the Noatak River are the principal commercial recreational ventures in the area.

Three groups of recreational anglers utilize the Noatak, Kivalina, and Wulik rivers: guided anglers, Kotzebue residents, and persons participating in float trips on the Noatak River. In 1983, approximately 1,400 grayling, 550 char, 500 northern pike, and 300 chum salmon were harvested from the Noatak River by sport fishermen. Kotzebue residents fly in or boat up to Noatak River tributary streams throughout the summer to fish. The Kelly River receives the heaviest fishing pressure; however, there is also light fishing pressure on the lower Kugururok and Nimiuktuk rivers (ADNR, 1987d).

In the fall, Kotzebue residents and residnets from outside the region fly in to the Wulik River to sport fish for char. The char harvest by sport fishermen was estimated to be approximately 700 fish in 1983. In addition, approximately 300 grayling were harvested. There is one guide camp located on the Wulik River and small groups of anglers from this camp fish in the Wulik and Kivalina rivers and some Noatak River tributaries throughout the summer (ADNR, 1987d).

Recreational use of the Noatak National Preserve is estimated at approximately 2,000 to 2,500 people per year. Sportfishing, river floating, and hunting account for a majority of the recreational use in the Preserve. A relatively small smount of backpacking and photography also takes place (NPS, 1986). The most popular use of the Noatak is floating the river in rafts, kayaks, or canoes. Most parties who float the Noatak also sport fish.

There are 25 commercial operators providing air charter and guiding services in the Noatak National Preserve; seven of these are based in Kotzebue at least part of the year. The gravel bar at the confluence of the Kelly and Noatak rivers is estimated to receive 40-50 percent of all visitor use in the preserve. During the summer of 1984, 325 people were personally contacted there by National Park Service employees. This location serves as a drop-off or pick-up point for fishing, hunting, floating, and other recreational or subsistence activities and many weekend fly-in visitors from Kotzebue also use it. In the upper Noatak River, the area near the mouth of Cutler River receives a smaller but still high amount of use because of its location. It is used as a take-out point for Preserve visitors floating the upper Noatak from Gates of the Arctic National Park as well as for hunting, fishing, and as a put-in point to float down the Noatak River (NPS, 1986).

The trend is for all recreational activities in the Noatak National Preserve to increase due to publicity about the area, a growing Alaska tourism industry, and because some of the commercial operators will become more active in promoting and expanding their services. The National Park Service estimates that recreational use in the Preserve will increase between 5-10 percent annually over the next few years (NPS, 1986).

Recreation Concerns: Some areas of recreational interest in the Attachment Area are being subjected to mineral resource development activities, primarily in the Delong Mountains of the Kivalina Unit and western Noatak Unit. The mineral development activities will likely increase as the Delong Mountains transportation corridor to the coast near Kivalina is completed, and as the Red Dog mine and other mineral deposits in the area are developed.

The present land status of the majority of the ADNR Northwest Planning Area Noatak Unit (Noatak National Preserve) minimizes the potential for non-recreational activities in that area since the Preserve management plan does not allow resource extraction activities (National Park Service, 1986). The Noatak National Preserve "General Management Plan" recommends increasing emphasis of research on cultural and natural resources to serve as a basis for informed management. To this end, the only projects currently envisioned in the Noatak National Preserve are a ranger station near the mouth of the Kelly River, and a summer seasonal station near Makpik Creek. These facilities are intended to provide National Park Service presence for recreational users and researchers.

The economic impacts of recreational activities in the Attachment Area west of the Noatak National Preserve are expected to be slight. Since activities are anticipated to be relatively low levels of commercial pursuits and "wilderness" recreation, the potential to generate significant income for businesses, create new investment opportunities, or provide seasonal jobs for residents is minimal. Economic benefits from recreation are likely to be split between residents of the area, other Alaskans, and people from outside the state. In the past, many jobs with recreational lodges or guiding operations have been held by people from outside the local area, and even outside the state (ADNR, 1987a).

The NANA coastal management program has identified concerns related to the interaction of recreation activities with Native culture and lifestyle, particularly subsistence activities. A primary concern is that visiting recreationists may compete for resources that are also used by local residents. Additionally, strangers may be unwelcome in areas traditionally used by local communities, or recreational activities may result in trespass on private lands (ADNR, 1987a). For these reasons, recreational use in rural areas should be closely examined to ascertain potential conflicts with current uses before additional recreational use is encouraged.

The Noatak National Preserve management plan recognizes the importance of recreational activities, particularly along the Noatak River corridor. Concerns have been expressed that concentrated human use can easily damage resources, and recovery in fragile habitats can be extremely slow (NPS, 1986).

Land Settlement:

Within the Attachment Area, state-owned and state-selected lands within the ADNR Northwest Planning Area have been rated for settlement potential (ADNR, 1987e). The settlement potential mapping process conducted by the state considered three factors: capability potential (inherent physical capability of the land to support settlement use); suitability potential (immediate potential of the land to be managed for settlement based on social or economic constraints or opportunities); and feasibility (areas with suitable potential that are most likely to be managed or used for settlement, including consideration of demand, type and quality of access, historical and existing use patterns, and land ownership). Most of the Attachment Area has been rated as "low" suitability or "unsuitable" for development. However, some stream corridors within the middle and upper watersheds of the Kivalina and Wulik Rivers have been identified as "moderate" potential for settlement.

Noatak National Preserve Management Plan:

The general management plan for the Noatak National Preserve (NPS, 1986) affects a significant portion of the Attachment Area (Map 7A). Section 202(8) of the Alaska National Interest Lands Conservation Act (ANILCA) authorizing the Noatak National Preserve identifies the management goals for the preserve.

To address these objectives, the Noatak National Preserve management plan has identified incompatible uses which would be contrary to the directives of the enabling ANILCA legislation. Of significant importance to the resources of the NANA region are concerns regarding adverse impacts to water quality, habitats, and fish and wildlife use of habitats. The Noatak National Preserve management plan has defined incompatible developments or actions to include:

- Activities that result in water pollution, sedimentation, or other impairment of fish spawning, rearing, feeding, and overwintering habitat, or other surface or ground water (e.g. logging, mining, waste disposal);
- Construction of roads, airstrips, and other surface disturbances that disrupt drainage patterns, accelerate erosion, increase runoff and sediment loads, or that unduly change the natural character of the preserve;
- Activities that impair wildlife's use of habitat on adjacent federal lands (e.g., substantial human population increase or habitat manipulations affecting distribution of wildlife); and
- Disposal of refuse in a manner that attracts bears, pollutes water resources, or otherwise impairs public health and safety

The identification of these impact-producing activities as non-compatible uses of lands within the Preserve will strongly influence the types of uses and activities which may occur within that portion of the Attachment Area located in the Noatak National Preserve.

PART 3: SUPPLEMENTAL COASTAL BOUNDARY FOR THE ATTACHMENT AREA

This Supplemental Coastal Boundary chapter provides justification for modifying the Northwest Arctic Borough coastal boundary to address habitats, biological resources, mineral resources, and potential development activities in the Attachment Area. The criteria and rationale for boundary adjustment were presented in the Volume 1, Plan Document, Coastal Area Boundary (October 1985). This discussion of coastal area boundary for the Attachment Area is based on a similar approach which includes:

- Resources Dependent on Coastal Waters
- Anadromous Fish Distribution
- Uses and Activities in the Coastal Area
- Direct and Significant Impacts on Coastal Resources

Since the resources dependent on coastal waters have been previously established and direct and significant impacts on coastal resources have been identified (Volume 1), the following discussion will focus on the distribution of anadromous fish habitats within the Attachment Area and the likely uses and activities which may be anticipated to affect these coastal resources.

Anadromous Fish Distribution

As discussed in Part 1 and shown on Maps 3A and 4A, important anadromous fish habitats have been documented in extensive portions of the watersheds of the Kivalina, Wulik, Noatak, Kelly, Kugururok, Kaluktavik, Nimiuktuk, and Anisak rivers in the Attachment Area . In particular, the distribution of anadromous Arctic char extends into the headwaters of most of these systems, well beyond the northern border of the Northwest Arctic Borough. Additionally, salmon (particularly chum salmon) utilize areas of river and stream habitat both within the Attachment Area and in immediate downstream areas in close proximity to the Attachment Area.

The information presented on Maps 3A and 4A represents the current state of knowledge concerning anadromous fish distribution. In many instances, limited funding for research and logistical problems associated with surveys in remote areas are the principal factors affecting documentation of fish distribution.

Anadromous fish are recognized as a resource dependent on coastal waters for a portion of their life history. As such, the welfare and continued viability of these coastal resources is totally dependent on the utilization of both marine and freshwater aquatic environments. The river and stream habitats of the Attachment Area are utilized by anadromous fish for migration, spawning, incubation of eggs, rearing, and (in the case of Arctic char) overwinter-

ing of mature adults and juveniles. Aquatic habitats suitable for spawning require a relatively specific stream substrate, adequate water temperature and intergravel flow, sufficient oxygen, and water free of pollutants which may adversely affect incubating egg growth or the emergence of fry. These requirements limit the number of locations within the Attachment Area which can provide suitable spawning habitat for anadromous fish.

The extreme winter conditions of the Attachment Area are even more limiting on the avaioability of suitable overwintering locations for anadromous fish. In addition to the water quality factors noted above for spawning areas, overwintering locations must also provide adequate surface flow to maintain populations of adult and juvenile fish. In an area where many streams cease flow completely in the winter or freeze solidly to the stream bottom, suitable overwintering areas become critical to the survival of anadromous fish populations.

Uses and Activities

Of the potential uses and activities of resources which may occur in the Attachment Area (discussed in Part 2), the exploration and development of mineral resources are the activities with the greatest likelihood of occurrence. The Resource Analysis (Volume 2, Background Report) and the Coastal Area Boundary discussion (Volume 1, Plan Document) present the potential impacts to coastal resources and habitats associated with mineral development. Of particular concern are exploration or development activities which may adversely affect stream flow or water quality, introduce toxic or hazardous materials, alter surface or subsurface water flow, induce hydraulic or thermal erosion, or adversely impact the integrity or function of aquatic habitats important to anadromous fish.

The Attachment Area is located within an area of the DeLong Mountains which has significant potential for the production and additional discovery of mineral resources. Within the watersheds of the Kivalina and Wulik Rivers in the Attachment Area, the ADNR Northwest Area Plan (ADNR, 1987c) has rated the mineral potential of the lands as high to very high for sediment-hosted lead-zinc, stratiform barite, mafic-ultrmafic copper-nickel-platinum group elements, mafic-ultramafic chromium, carbonate-hosted lead-zinc, and placer gold. Lands in the watershed of the Kelly River have been listed as moderate to high potential for many of the same minerals.

The ADNR Northwest Area Plan (1987c) has also identified the generalized location of historic and active mining claims and stream placer locations. Within the Attachment Area, the upper watersheds of the Kivalina and Wulik Rivers are noted for extensive historic and active mining claims. A western tributary to the lower Kelly River is identified for historic/active mining claims, and an eastern tributary to the Kelly River is identified for stream placer locations. The Wulik River watershed is also the location of known mineral deposits and the world-class Red Dog lead/zinc mine and transportation corridor currently under construction, as described in Part 2.

Although there is currently no mineral development activity within the Noatak National Preserve, the area will likely receive surficial evaluation for minerals. The presence of

mineral deposits at Drenchwater (10 miles north of the Noatak National Preserve), Ginnie Creek (tributary to the Kugururok River), and Story and Whoopie Creeks (tributaries to the Aniuk river) and the mineralized terrane which extends along the south side of the DeLong Mountains suggests the potential for similar mineral discoverie s in the Attachment Area east of the Kelly River watershed.

Coastal Boundary

The coastal area boundary within the Attachment Area encompasses the watersheds of the Kivalina, Wulik, Kelly, Kugururok, Kaluktavik, and Nimiuktuk Rivers to the northern limit of the Northwest Arctic Borough. The extent of the coastal area boundary is shown on the Coastal Boundary Map.

Coastal Boundary: Option A

The offshore coastal boundary of the Northwest Arctic Borough Attachment Area extends seaward three miles from the coastline to encompass the limits of state jurisdiction (Map A). The inland coastal boundary of the Attachment Area is modified from the interim coastal boundary to include the watersheds of the the Kivalina, Wulik, and Kelly Rivers to the northern boundary of the Northwest Arctic Borough (Map A).

The modification of the inland coastal boundary from the approximate 200-foot elevation contour of the interim coastal boundary is based on:

- 1)the presence and documented distribution of important coastal resources (primarily anadromous fish);
- 2)the occurrence of historic and current mineral development operations and the high to very high mineral development potential within the remainder of the area;
- 3)the ongoing construction of a port near Kivalina and a haul road transportation corridor to the Red Dog mine which will facilitate future mineral development;
- 4)the ownership and management of state and private (native corporation) lands in this portion of the Attachment Area which provide for future economic development activities; and
- 5)the potential impacts of recognized and likely uses and activities on the habitats, resources, and use areas within the coastal boundary.

Since initial delineation of the Biophysical Boundaries for Alaska's Coastal Zone (ADF&G, 1978), the base of information concerning the coastal resources of the Attachment Area has been greatly expanded to recognize the importance of high value coastal habitats within this region. In addition, mineral development activities have progressed from the reconnaissance level to full scale development of a world-class lead-zine mine at Red Dog with associated transportation facilities. The Northwest Arctic Borough recognizes that this coas-

tal boundary extension is necessary to manage uses and activities which have the potential to directly affect the resources of the coastal zone.

Coastal Boundary Compatibility of Option A

The northern boundary of the Northwest Arctic Borough Attachment Area adjoins the lands of the North Slope Borough. Near Singoalik Lagoon at 68 degrees north latitude, the North Slope Borough coastal boundary extends approximately 25 miles inland to encompass the interim coastal boundary. In this area, the distribution of coastal resources and habitats makes a transition from a "belt" which parallels the coast (North Slope Borough) to a series of broad river valleys which extend inland from the coastline along the southern flanks of the Brooks Range (Northwest Arctic Borough). Potential uses and activities in the Attachment Area also change from the North Slope Borough area immediately to the north as a reflection of the mineralized zone which extends to the east across the Brooks Range in the Northwest Arctic Borough.

Since the Northwest Arctic Borough coastal boundary in the Attachment Area is associated with coastal resources in aquatic habitats and wetlands along inland-extending river valleys, the locations of concern differ markedly from the specific locales of interest in the North Slope Borough coastal program. However, the basic interests of both coastal programs for protection of coastal resources (including anadromous fish), maintenance of subsistence activities, and provision for development activities in a manner which minimizes adverse disturbance to coastal resources are consistent between the North Slope Borough and Northwest Arctic Borough.

The commonality of goals and resource interests, and the limited area of directly adjoining coastal boundary between the two programs due to topography and resource distribution indicate that the Northwest Arctic Borough and North Slope Borough coastal management programs are compatible for purposes of consistent administration of the Alaska Coastal Management Program.

Coastal Boundary: **Option B**

The offshore coastal boundary of the Northwest Arctic Borough Attachment Area extends seaward three miles from the coastline to encompass the limits of state jurisdiction (Map B). The inland coastal boundary of the Attachment Area is modified from the interim coastal boundary to include the watersheds of the the Kivalina, Wulik, Kelly, Kugururok, and Kaluktavik Rivers to the northern boundary of the Northwest Arctic Borough (Map B).

The modification of the inland coastal boundary from the approximate 200-foot elevation contour of the interim coastal boundary is based on:

- 1)the presence and documented distribution of important coastal resources (primarily anadromous fish);
- 2) the occurrence of historic and current mineral development operations in the western portion of the Attachment Area, and the mineral development potential within and in the headwaters of streams in the remainder of the coastal boundary;
- 3) the ongoing construction of a port near Kivalina and a haul road transportation corridor to the Red Dog mine which will facilitate future mineral development;
- 4) the likely impacts of potential uses and activities on the habitats, resources, and use areas within the coastal boundary.

Since initial delineation of the Biophysical Boundaries for Alaska's Coastal Zone (ADF&G, 1978), the base of information concerning the coastal resources of the Attachment Area has been greatly expanded to recognize the importance of high value coastal habitats within this region. In addition, mineral development activities in the western portion of the Attachment Area have progressed from the reconnaissance level to full scale development of a world-class lead-zine mine at Red Dog with associated transportation facilities. The Northwest Arctic Borough recognizes that this coastal boundary extension is necessary to manage uses and activities which have the potential to directly affect the resources of the coastal zone.

Coastal Boundary Compatibility of Option B

The northern boundary of the Northwest Arctic Borough Attachment Area adjoins the lands of the North Slope Borough. Near Singoalik Lagoon at 68 degrees north latitude, the North Slope Borough coastal boundary extends approximately 25 miles inland to encompass the interim coastal boundary. In this area, the distribution of coastal resources and habitats makes a transition from a "belt" which parallels the coast (North Slope Borough) to a series of broad river valleys which extend inland from the coastline along the southern flanks of the Brooks Range (Northwest Arctic Borough). These rivers flow directly into marine waters (Kivalina and Wulik Rivers) or are part of the Noatak River watershed northern tributaries (Kelly, Kugururok, and Kaluktavik Rivers). Potential uses and activities in the Attachment Area also change from the North Slope Borough area immediately to the north to reflect development opportunities in the mineralized zone which extends to the east across the Brooks Range in the Northwest Arctic Borough.

Since the Northwest Arctic Borough coastal boundary in the Attachment Area is associated with coastal resources in aquatic habitats and wetlands along inland-extending river valleys, the locations of concern differ markedly from the specific locales of interest in the North Slope Borough coastal program. However, the basic interests of both coastal programs for protection of coastal resources (including anadromous fish), maintenance of subsistence activities, and provision for development activities in a manner which minimizes adverse disturbance to coastal resources are consistent between the North Slope Borough and Northwest Arctic Borough.

The commonality of goals and resource interests, and the limited area of directly adjoining coastal boundary between the two programs due to topography and resource distribution indicate that the Northwest Arctic Borough and North Slope Borough coastal management programs are compatible for purposes of consistent administration of the Alaska Coastal Management Program.

Coastal Boundary : Option C

The offshore coastal boundary of the Northwest Arctic Borough Attachment Area extends seaward three miles from the coastline to encompass the limits of state jurisdiction (Map C). The inland coastal boundary of the Attachment Area is modified from the interim coastal boundary to include the watersheds of the the Kivalina, Wulik, Kelly, Kugururok, Kaluktavik, and Nimiuktuk Rivers to the northern boundary of the Northwest Arctic Borough, and a one mile corridor from ordinary high water along both sides of the main stem of the Noatak River extending upstream from the watershed of the Nimiuktuk River to the confluence with the Cutler River (Map C).

The modification of the inland coastal boundary from the approximate 200-foot elevation contour of the interim coastal boundary is based on:

- 1) the presence and documented distribution of important coastal resources (primarily anadromous fish);
- 2) the occurrence of historic and current mineral development operations in the western portion of the Attachment Area, and the mineral development potential within and in the headwaters of streams in the remainder of the coastal boundary;
- 3) the ongoing construction of a port near Kivalina and a haul road transportation corridor to the Red Dog mine which will facilitate future mineral development;
- 4) the potential impacts of recognized and likely uses and activities on the habitats, resources, and use areas within the coastal boundary.

Since initial delineation of the Biophysical Boundaries for Alaska's Coastal Zone (ADF&G, 1978), the base of information concerning the coastal resources of the Attachment Area has been greatly expanded to recognize the importance of high value coastal habitats within this region. In addition, mineral development activities in the western portion of the Attachment Area have progressed from the reconnaissance level to full scale development of a world-class lead-zine mine at Red Dog with associated transportation facilities. The Northwest Arctic Borough recognizes that this coastal boundary extension is necessary to manage uses and activities which have the potential to directly affect the resources of the coastal zone.

Coastal Boundary Compatibility of Option C

The northern boundary of the Northwest Arctic Borough Attachment Area adjoins the lands of the North Slope Borough. Near Singoalik Lagoon at 68 degrees north latitude, the North Slope Borough coastal boundary extends approximately 25 miles inland to encompass the interim coastal boundary. In this area, the distribution of coastal resources and habitats makes a transition from a "belt" which parallels the coast (North Slope Borough) to a series of broad river valleys which extend inland from the coastline along the southern flanks of the Brooks Range (Northwest Arctic Borough). These rivers flow directly into marine waters (Kivalina and Wulik Rivers) or are part of the Noatak River watershed northern tributaries (Kelly, Kugururok, Kaluktavik, and Nimiuktuk Rivers). Potential uses and ac-

tivities in the Attachment Area also change from the North Slope Borough area immediately to the north to reflect development opportunities in the mineralized zone which extends to the east across the Brooks Range in the Northwest Arctic Borough.

Since the Northwest Arctic Borough coastal boundary in the Attachment Area is associated with coastal resources in aquatic habitats and wetlands along inland-extending river valleys, the locations of concern differ markedly from the specific locales of interest in the North Slope Borough coastal program. However, the basic interests of both coastal programs for protection of coastal resources (including anadromous fish), maintenance of subsistence activities, and provision for development activities in a manner which minimizes adverse disturbance to coastal resources are consistent between the North Slope Borough and Northwest Arctic Borough.

The commonality of goals and resource interests, and the limited area of directly adjoining coastal boundary between the two programs due to topography and resource distribution indicate that the Northwest Arctic Borough and North Slope Borough coastal management programs are compatible for purposes of consistent administration of the Alaska Coastal Management Program.

PART 4: SUPPLEMENTAL SPECIAL USE AREAS FOR THE ATTACHMENT AREA

Areas exhibiting unique resource values, habitats vulnerable to disturbance, important subsistence or cultural activity values, or important resource extraction potential may be recognized as Special Use Areas or Restricted Use Areas. Within the Attachment Area, several locations adjoin Restricted/Sensitive Use Areas which were designated in the Volume 2, Background Report (October 1985).

Areas previously identified included the Kivalina River, the Wulik River Arctic Char Overwintering Area, and the Noatak River Chum Spawning Area. Although the limits of these Restricted/Sensitive Use Areas stopped abruptly at 68 degrees north latitude, the resource values which supported designation of these locations did not.

Expanded Special and Restrictive and Sensitive Use Areas

Based on wildlife, subsistence, and resource development values and activities presented in Volume 1, Chapter 5.5.2 and 5.5.3 of the NANA coastal Management Plan, at least three Special and Restricted/Sensitive Use Areas should be expanded into the Attachment Area:

Wulik River Arctic Char Overwintering Area

The Wulik River Arctic Char Overwintering Area is a Restricted/ Sensitive Use Area requiring additional protection for biological resources. It supports spawning populations of anadromous Arctic char and is even more important for its overwintering habitat. Map 1A shows the recommended extension into the Attachment Area.

Upper Kivalina River

The Upper Kivalina River is a Restricted/Sensitive Use Area requiring additional protection for biological and subsistence resources. It is important spawning habitat for chum salmon and Arctic char and overwintering habitat for Arctic char. Subsistence use is similar to that described in Volume 1, Chapter 5.5.3. Map 1A shows the recommended extension into the Attachment Area.

Noatak River Chum Spawning Area

The Noatak River Chum Spawning Area is a Restricted/Sensitive Use Area requiring additional protection for biological resources. It is important spawning habitat for chum salmon and Arctic char and overwintering habitat for Arctic char. Map 1A shows the recommended extension into the Attachment Area.

Red Dog Mine Site and Lik-Su Deposit

Both the Red Dog Mine Site and the Lik-SU deposit are recommended for classification as Special Use Areas. The rationale behind this recommendation is similar to that presented for the Red Dog Mine Transportation Corridor Special Use Area described in Volume 1, Chapter 5.5.2. The use area would allow for development of mineral resources to benefit the region's residents while providing mitigation measures to protect subsistence uses and biological resources. The choice faced by the Northwest Arctic Borough is whether to make these area an extension of the Red Dog Transportation Special Use Area, to combine them into a new Special Use Area, or create two new Special Use Areas. Map 1a shows the recommended extension/ creation of Special Use Areas in the Attachment Area.

REFERENCES

Alaska Department of Fish and Game (ADF&G). 1987. An atlas to the catalog of waters important for spawning, rearing, or migration of anadromous fishes. Arctic Region, Resource Management Region IV. Habitat Division. Anchorage, Ak.

_____. 1986. Alaska Habitat Management Guide, Arctic Region. Map Atlas. Habitat Division. Juneau, Ak.

_____. 1978. Biophysical Boundaries for Alaska's Coastal Zone. Marine Coastal Habitat Management Program. Anchorage, Ak.

_____. 1974. Alaska's Wildlife and Habitat. Juneau, Ak.

Alaska Department of Natural Resources (ADNR). 1987a. Northwest Area Plan: Recreation Resource Report (draft). Planning Document 6158-8 prepared by Div. of Land and Water Management. Fairbanks, Ak.

_____. 1987b. Northwest Area Plan: Oil and Gas Resource Report (draft). Planning Document 6158-7 prepared by Div. of Land and Water Management, Resource Allocation Section. Fairbanks, Ak.

_____. 1987c. Northwest Area Plan: Minerals Resource Report (draft). Prepared by Div. of Land and Water Management, Resource Allocation Section. Fairbanks, Ak.

_____. 1987d. Northwest Area Plan: Fish and Wildlife Resource Report (draft). Planning Document 6158-4 prepared by Ak. Department of Fish and Game, Habitat Division, for Div. of Land and Water Management. Fairbanks, Ak.

_____. 1987e. Northwest Area Plan: Land Conveyance Resource Report (draft). Planning Document 6158-10 prepared by Div. of Land and Water Management, Resource Allocation Section. Fairbanks, Ak.

Alaska Department of Natural Resources and Alaska Department of Commerce and Economic Development (ADNR and ADCED). 1984. Alaska's Mineral Industry 1983. Fairbanks, Ak.

_____. 1985. Alaska's Mineral Industry 1984. Fairbanks, Ak.

_____. 1986. Alaska's Mineral Industry 1985. Fairbanks, Ak.

James, D.D., and K. Cannon. 1985. Moose demography aerial survey of the middle Noatak River valley, late winter, 1985. Prepared by Alaska Dept. Fish and Game, Game Div., and National Park Service. Kotzebue, Ak.

National Park Service (NPS). 1986. Noatak National Preserve, Alaska: general management plan, land protection plan, wilderness suitability review. National Park Service, Alaska Region. Anchorage, Ak.

Singer, F.J., D. Johnson, and R. Quimby. 1984. Dall sheep numbers and distribution in the Noatak National Preserve, 1983. National Park Service, Alaska Region, Natural Resources Survey and Inventory Report AR-83/0. Prepared by National Park Service, Anchorage, Ak., and Ak. Dept. Fish and Game, Kotzebue, Ak.

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